REMARKS

In the Office Action, the Examiner rejected claims 1-5, 7, 9-18, 20, 22-31, 33, 35, 37-41, and 43-50. The present Response neither amends nor cancels any claims. As such, claims 1-5, 7, 9-18, 20, 22-31, 33, 35, 37-41, and 43-50 remain pending and are believed to be in condition for allowance. Applicants respectfully request reconsideration and allowance of all pending claims in view of the following remarks.

Preliminary Remarks

As a preliminary matter, Applicants respectfully note that the rejections set forth by the Examiner under Section 103 do not appear to *clearly* address each pending claim. Particularly, Applicants note that the entirety of the Examiner's rejection with regard to claims 1-5, 7, 9-18, 20, 22-31, 33, 35, 37-41, 43, 45, 47, and 49, which were rejected in the instant Office Action based upon Bayer et al., U.S. Patent 7,529431 (hereinafter "the Bayer reference," newly cited) in view of Hossack et al., U.S. Patent 6,014,473 (hereinafter "the Hossack reference," previously of record), states the following:

> Bayer et al disclose a method for acquisition of rotational ultrasound data of an organ for derivation of 3d motion data for that organ. One and two-dimensional image data is captured over a time period and from specific relative locations with respect to the target, including acquisition of perpendicular data around a target area or organ within the body. These acquisitions (Fig 3-4) create partial image areas in 2d planes which are reconstructed to form 3d data. The data uses intersecting planes to reconstruct multi-dimensional representations of the motion of an organ within the body.
>
> Bayer et al discloses the above-mentioned 1d to 3d data acquisition, but does not disclose how combinations of data and validation of data are performed via vectors. The attention here is directed to the Hossack reference of record, which discloses derivation of motion vectors from motion data as a transducer is rotated or otherwise swept across an

image area, and also validation of data using another sensor-based methodology (Fig 21). Hossack discloses incorporation of relative positional data, with the motion data derived from imagers/sensors to provide motion vectors and generate 3d motion data from original datasets. As understood now, the validation of data of Figure 21 and the corresponding disclosure provides for a reference of absolute position of the imagers/sensors during operation. As the device of Hossack sweeps over an area, a series of vectors (Fig 13-14) are derived producing planar vectors from the motion data at that position. As shown within Figure 13 and the corresponding disclosure, 2 sets of motion vectors are derived from each tracking array, and a third set of motion vectors is derived from a data-based average or mathematical analysis of the motion data to acquire a third set of motion data (Cot 18 line 20-Col 19 Line 50, Col 14 Line 55-Col 15 Line 30, Col 5 Line 45-Col 7 Line 65).

Hossack discloses acquisition of motion along with image data (along a depth axis in cylindrical coordinates, Col 9 Line 1-10), first as an unreconstructed set of image data (Col 12 Line 40-Col 13 Line 60), used as a relative measurement, and second as a tool for creating a reconstructed set of image data (Col 15 Line 30-Col 16 Line 40). Hossack et al disclose that the sensor based methods and system can include an accelerometer or ultrasonic sensors for measurement of motion (Col 7 line 59-65), the use of the sensor based motion determination system to provide with the imager, three- dimensional motion data for a target region including depth-resolved motion vectors (Col 14 Line 1-35, Col 23 Line 30-Col 24 Line 45), and finally the measurement of annular mechanical motion data (Col20 Line30-50). It would have been obvious to one of ordinary skill in the art at the time of the invention to have utilized the methods and system of Hossack et al with either 1d, 1.5d (as disclosed in Hossack as well) or 2d datasets as the methods of Bayer show how either set of data can be used to create 3 or 4d depictions of internal structures.

Office Action, pages 2-4.

After careful review, it appears that the "rejections" provided by the Examiner are essentially a generalized summary regarding the alleged teachings of the Bayer and Hossack references. It does not appear, however, that each pending claim was addressed with sufficient clarity so as to enable Applicants to effectively respond. Indeed, the rejection does not appear to specifically identify which claims are believed by the Examiner to be disclosed in the cited portions of the references.

With this in mind, Applicants respectfully remind the Examiner of the provisions set forth under 37 C.F.R. §1.104(c)2, which states:

> When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.

See also M.P.E.P. §707.07. (Emphasis added). Indeed, Applicants stress that generalized rejections, such as those provided in the instant Office Action, fall far short of the level of analysis required by 37 C.F.R. §1.104 and by M.P.E.P. §706, which states in relevant part, that: "[t]he goal of examination is to clearly articulate any rejection early in the prosecution process so that the Applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity." M.P.E.P. §706. (Emphasis added).

In view of the these deficiencies, Applicants have effectively been denied the opportunity to effectively prosecute the present application, as it is difficult to address each claim when the Examiner has not clearly specified the portion of the references relied upon for each pending claim. As such, Applicants respectfully request that the Examiner provide a proper examination that *clearly addresses each rejected claim* in a future non-final Office Action. Further, notwithstanding these deficiencies, Applicants have made an earnest and

good-faith attempt by this Response to point out what are believed to be deficiencies of the Bayer, Hossack, and other secondary references relied upon by the Examiner.

Claim Rejections Under 35 U.S.C. §103

The Examiner rejected claims 1-5, 7, 9-18, 20, 22-31, 33, 35, 37-41, 43, 45, 47, and 49 under 35 U.S.C. §103 as being unpatentable over the Bayer reference in view of the Hossack reference, as mentioned in the "Preliminary Remarks" section above. The Examiner further rejected claims 44, 46, 48, and 50 as being unpatentable over the Bayer and Hossack references in view of Wilk et al., U.S. Patent No. 7,595,665 (hereinafter "the Wilk reference). Applicants respectfully traverse the rejections.

Legal Precedent

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). To establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). In addressing obviousness determinations under 35 U.S.C. §103, the Supreme Court in *KSR International Co. v. Teleflex Inc.*, No. 04-1350 (April 30, 2007), reaffirmed many of its precedents relating to obviousness including its holding in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). In *KSR*, the Court also reaffirmed that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *Id.* at 14. In this regard, the *KSR* court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does … because inventions in most, if not all, instances rely upon

building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *Id.* at 14-15.

Furthermore, the *KSR* court did not diminish the requirement for objective evidence of obviousness. *Id.* at 14 ("To facilitate review, this analysis should be made explicit. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness"). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ."); s*ee also, In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002) (holding that the factual inquiry whether to combine references must be thorough and searching, and that it must be based on *objective evidence of record*).

Additionally, when prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

Deficiencies of the Bayer and Hossack references

Independent claim 1 recites, *inter alia*, "acquiring a first set of one-dimensional motion data for an organ along a first axis by a first methodology; acquiring a second set of one-dimensional motion data for the organ along a second axis by a second

methodology, wherein the first axis and the second axis are perpendicular; acquiring a third set of one-dimensional motion data for the organ along a third axis by a third methodology, wherein the third axis is perpendicular to the first axis and the second axis; deriving one or more concurrent motion vectors from *each* of the first, second, and third sets of one-dimensional motion data; and combining the one or more concurrent motion vectors to generate a set of three-dimensional motion data for the organ." (Emphasis added). Independent claim 14 recites a computer readable storage medium having executable code stored thereon comprising routines for performing the steps recited by independent claim 1.

Next, independent claim 27 recites an imaging system comprising, *inter alia*, "an imager configured to generate a plurality of signals representative of one or more structures within a region of interest ... a sensor-based motion determination system configured to acquire one-dimensional motion data from one or more sensors ... wherein the imager, the sensor-based motion determination system, or a combination of the imager and the sensor-based motion determination system is configured to acquire a first, a second, and a third set of one-dimensional motion data for an organ along respective first, second, and third perpendicular axes ... and wherein at least one of the sensor-based motion determination system, the data processing circuitry, or the operator workstation are configured to derive one or more concurrent motion vectors from *each* of the first, second, and third sets of one-dimensional motion data and to combine the one or more concurrent motion vectors to generate a set of three-dimensional motion data for the organ." (Emphasis added).

Further, independent claim 38 recites, *inter alia*, "an imager configured to generate a plurality of signals representative of one or more structures within a region of interest and to acquire at least one set of acquisition image data used to derive a first, a second, or a third set of one-dimensional motion data for an organ along respective first,

second, and third perpendicular axes … wherein at least one of the data processing circuitry or the operator workstation is configured to derive one or more concurrent motion vectors from *each* of the first, second, and third sets of one-dimensional motion data and to combine the one or more concurrent motion vectors to generate a set of three-dimensional motion data for the organ." (Emphasis added).

As discussed in detail below, certain features recited by these independent claims are believed to be absent from the Bayer and Hossack references, taken either alone or in combination.

In the Previous Response, Applicants stressed that the Hossack reference fails to disclose the acquisition of one-dimensional motion data for an organ. *See, generally,* Response filed on 9/30/2009. In contrast, the Hossack reference is directed towards a technique for acquiring *two-dimensional* motion data. Indeed, as previously noted, the "Background" section of the Hossack reference clearly states that the invention "relates to an improved system, method and transducer for acquiring two-dimensional image information and relative positional information regarding the image information to allow subsequent three-dimensional or extended field of view reconstruction." Hossack, col. 1, lines 14-18. (Emphasis added).

In response to Applicants' previous arguments, the Examiner now alleges in the present Office Action that the newly cited Bayer reference teaches the acquisition of one-dimensional motion data acquired along three different respective perpendicular axes. Applicants respectfully disagree with this assertion. To the contrary, the Bayer reference appears to be focused upon a technique for deriving three-dimensional data from two-dimensional data planes. Indeed, as clearly shown in Figs. 3 and 4, intersecting two-dimensional planes 6 are acquired within a multi-dimensional voxel space 9. The Bayer reference then generally states that a distance 12 is determined between each element 15a

within the two-dimensional image planes and each element 15b outside of the two-dimensional image planes. As best understood, Bayer using these distances 12 as a "search radius" to interpolate a three-dimensional image.

While the primary embodiment of the Bayer reference clearly discloses a technique for deriving a three-dimensional image based upon two-dimensional data, Applicants note that the Bayer reference does appear to mention that the disclosed technique may also be performed using one-dimensional data. However, other than a passing comment that the use of one-dimensional data is possible, the Bayer reference does not appear to disclose, elaborate, or even explain how the disclosed technique, when applied to one-dimensional data, may be used to derive a three-dimensional image. Thus, the Bayer reference does not appear to actually enable such a technique.

Further, even assuming that the Bayer reference reasonably discloses the use of one-dimensional data, the Bayer reference is still deficient with regard to three sets of one-dimensional data (e.g., the recited first, second, and third sets) acquired along respective perpendicular axes (e.g., an x, y, and z axis). That is, the mere mention of one-dimensional does not reasonably disclose acquiring three different sets of perpendicular one-dimensional data, as recited by independent claims 1, 14, 27, and 38.

Moreover, Applicants do not believe the Hossack reference, which was cited in combination with the Bayer reference, obviates the above-discussed deficiencies, as this appears to be the reason for the Examiner's present reliance on the Bayer reference in the first place. As such, no *prima facie* case of obviousness is believed to exist with regard to independent claims 1, 14, 27, and 38, based upon the Bayer and Hossack references. Therefore, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. §103 and allowance of independent claims 1, 14, 27, and 38, as well as those claims depending therefrom.

The combination of the Bayer and Hossack references is improper

As discussed above, each of independent claims 1, 14, 27, and 38 recite the acquisition of one-dimensional motion data along three respective axes that are each perpendicular with respect to one another. Even assuming that Bayer and/or Hossack could be construed as disclosing these recited features (which Applicants do not concede for at least the reasons discussed above), Applicants do not believe that there is any objective motivation for combining the Bayer and Hossack references in the manner suggested by the Examiner. Particularly, each reference appears to adequately address the issue of deriving a three-dimensional image from data having lesser spatial dimensions (e.g., two-dimensional data), and thus would not appear to benefit from the modifications suggested by the Examiner.

For example, the Bayer reference teaches the acquisition of two-dimensional data in a voxel space, and the interpolation of a three-dimensional image by determining the distance between each image element (e.g., 15a) and each non-image element (e.g., 15b). The Hossack reference teaches the use of an ultrasound device having a main two-dimensional image acquisition array as well as two tracking arrays. The image data acquired by the main array and tracking arrays are interpolated to generate a three-dimensional image using a "3-D volume filling computer."

With the above discussion in mind, Applicants note that the Hossack reference essentially addresses the same problem set forth in the Bayer reference, but in a different manner. To summarize, the Bayer reference interpolates a three-dimensional based upon the distances between each image element and each non-image element in a voxel space. The Hossack reference interpolates a three-dimensional image by processing a two-dimensional image in combination with tracking data from two tracking arrays. However, nothing in either of these references appear to suggest that there is a problem or drawback with the way in which each respective reference generates three-dimensional

image data, nor has the Examiner identified such a deficiency in either reference. Therefore, because both the Bayer and Hossack references appear to adequately address the subject of three-dimensional image generation, there appears to be no objective basis for modifying the Bayer reference, as suggested by the Examiner.

In other words, because the Bayer reference already teaches a suitable technique for computing a three-dimensional image, one skilled in the art would find no need to further modify the Bayer reference, nor has the Examiner provided any reasonable objective basis as to why one skilled in the art would want to further modify the Bayer reference to essentially solve a problem that has *already* been solved. Instead, Applicants believe that the motivation proffered by the Examiner appears to be nothing more than a pretext for an unneeded modification to the Bayer reference solely to justify the present rejection, i.e., the motivation appears to be based solely on the improper use of hindsight. Such a motivation is clearly not objective nor is it based on the teachings demonstrated in the art.

Thus, given the absence of an objective motivation to combine the Bayer and Hossack references, the rejection of the pending claims is believed to be improper for at least this additional reason.

Deficiencies of the Rejection of Claims 44, 46, 48, and 50

Claims 44, 46, and 48 depend from claims 1, 14, and 27, respectively, while claim 50 is written in independent form. Each of these claims generally recites sensors, which are affixed to a subject of interest and were rejected by the Examiner based upon the Bayer and Hossack references in further combination with the Wilk reference. As discussed above, however, Bayer and Hossack do not appear to teach or suggest every recited feature of independent claims 1, 14, and 27, namely the acquisition of one-

dimensional data along three axes that are perpendicular with respect to each other. Additionally, Applicants note that independent claim 50 also recites these features.

With regard to the Wilk reference, the Examiner relied solely upon the Wilk reference for teaching an array of sensors that may be mounted to the skin of a patient. This reliance alone, however, does not appear to obviate the deficiencies of the Bayer and Hossack references, as noted above. Thus, independent claim 50 is believed to be allowable over combination of Bayer, Hossack, and Wilk for the subject matter separately recited, and dependent claims 44, 46, and 48 are believed to be allowable over the combination of Bayer, Hossack, and Wilk at least by virtue of their dependencies from independent claims 1, 14, and 27, respectively.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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